CEMENT MILL SECTION of Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of portland cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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Constant-Weight Feeder Regulates Flow of Dry Materials

Installation and Operating Costs Are Low—Automatic Regulation Based on Weight—Adjusting Rate of Feed —Capacity Covers Wide Range

THE most essential performance required of a mechanism for feeding dry materials in cement plant operation is that of constancy in the rate of delivery.

Equipment such as screw feeders, in use for many years, often delivers material at irregular rates. The irregularity is frequently aggravated from causes such as flooding or arching in the bins from which the material is being taken, thereby greatly increasing the fluctuations in rate of flow. With the old type of single or double screw feeders employed in the cement industry for many years, and still being used by many plants, little can be done to overcome arching and flooding and the consequent irregularity in flow resulting from them. Yet it is well known that uniformity of the finished product is next to impossible unless uniformity of feed is maintained.

Working Toward Uniformity of Flow

This uniformity of feed is necessary, whether one is dealing with the feeding of raw meal and pulverized coal to the kiln, or with the feed of coarse granular materials to ball mills, tube mills, or rod mills.

Manufacturers of cement mill equipment have proceeded in various directions in their attempts to attain uniformity in the rate of feed of dry materials. Some have developed mechanisms that utilize the screw conveyor principle, and others have developed volumetric feeders of the disc and rotating drum type, in all of which efforts are made to prevent flooding and to liberate entrapped air, thus attaining a high degree of uniformity in volume and in specific gravity.

Developing Control of Weight

Other manufacturers have gone further, developing feeding devices designed to attain uniformity of weight rather than of volume. Since mill capacity is a function of the weight of the material being fed, these manufacturers have seen the need for making weight control the principal feature of their feeding equipment. In this manner the troublesome problem of entrapped air can be ignored, and that is true also of smaller variations in specific gravity arising from causes other than flooding.

Figures 1 and 2 show a type of dry feeder which has been notably successful in the cement mill field. It is known as the constant-weight feeder, developed by the Hardinge Company and designed to accomplish automatically a uniformity of weight in the rate of flow.

This constant-weight feeder regulates the flow of dry and moist coarse and fine feeds, and mixtures of both. Installation, operation and adjustment are simple. The hopper of the feeder is bolted to the bin bottom, the motor wire is plugged into an electric light socket, and the feeder is ready to operate. The feeder is a self-contained unit, operated by a small motor and speed reducer that are supplied with the unit.

Automatic Regulation of Flow

This feeder acts on the principle of a beam scale balanced around a pivot point centrally located under, and supported from the feed hopper. The beam element consists of a frame to which is attached a traveling belt actuated by a motor and other driving mechanism supported on the frame. Constant balance is maintained against a counterweight at a predetermined setting, by the regulation of the depth of feed passing through a gate on the feed hopper, that is also connected to the balanced frame. When the weight of material on the belt increases, the frame moves downward, closing the gate slowly until the reduced quantity of material permits the belt to raise and again open the gate to the normal position of balance. Thus a constant weight is always obtained, even though the character or size of feed may change continually.

If the weight of the conveyed material decreases, the lessened weight permits the belt and frame to rise. This automatically causes the feed gate to rise, thus increasing the quantity of material fed onto the belt. These adjustments are constantly taking place as the variations occur in the weight of the material, regardless of the causes of such variations.

How Rate of Feed Is Adjusted

The adjustment for the quantity of feed desired is made by means of a balancing weight which, when once set, maintains the rate of flow at a constant weight. The fact that the motor, as previously stated, is mounted on the same frame as the belt eliminates any possibility of irregularity in feed through variations in belt pull.

It is this method of operation that makes it possible to drive this feeder with a very small motor, with consequent low power consumption. Even the six different units of the "C" type, handling anywhere from a minimum of 2 tons to a maximum of 125 tons per hour, are each driven by a motor of only ½ h.p.

Dimensions and Weights

The compactness of these feeder units and the small space occupied by them may be judged from the principal dimensions of the units designated as sizes A, B and C, and shown in detail in Figure 2. Some of the lettered dimensions, as well as weights and other data pertaining to these units, are given in Table 1.

TABLE 1. DATA OF FEEDER UNITS SHOWN IN FIGURE 2

Feeder	Length A	Width B	Depth C	Weight, Lb.	Motor, H.P.
Size A	3′0″	17″	17⅜″	350	1/6
Size B	3′9½″	25⅛″	19⅜″	500	1/4
Size C	4′1″	3′3¼″	20⅜″	700	1/2

A larger unit, of greater capacity than that required in the cement industry, is designated as size D. It is 9 ft. long, 3 ft. 11¼ in. wide, and 3 ft. deep. The weight is 1,300 lb. and the driving motor is ½-h.p.

Control Devices

By means of a remote control device, which is an additional attachment, the feed may be varied from a point at any desired distance from the feeder itself. Synchronizing mechanisms may also be employed to vary the flow of two or more feeders at the same time.

Another control attachment either signals the operator or actuates a bin-rapping device when the material fails to flow from the bin because of arching or any other cause.

Tramp iron, or very coarse particles of material, lift the gate automatically and pass through without trouble.

Maintains Constant Proportions in Mixtures

This type of constant-weight feeder has been found to have exceptional value in the cement industry wherever it is necessary to maintain fine adjustments of proportions of the mixtures fed to the kiln. When the kiln feed comes from several sources, the feeders may be controlled simultaneously by means of the synchronizing mechanism previously mentioned, thereby maintaining the uniformity of the mixture. At the same time a record is kept of the weight of the material delivered by each feeder, over a given period of time, through use of the rate indicator supplied with the feeder. This rate indicator is, in fact, supplied as a part of the standard equipment, thus making it possible to record the total weight of material fed in any given time.

Wide Range of Capacity

The feeders here described are made in sizes designed to handle from a few pounds per hour up to 200 tons per hour. In one Ohio valley cement plant, for instance, these units are used to feed both clinker and gypsum to the ball mills.

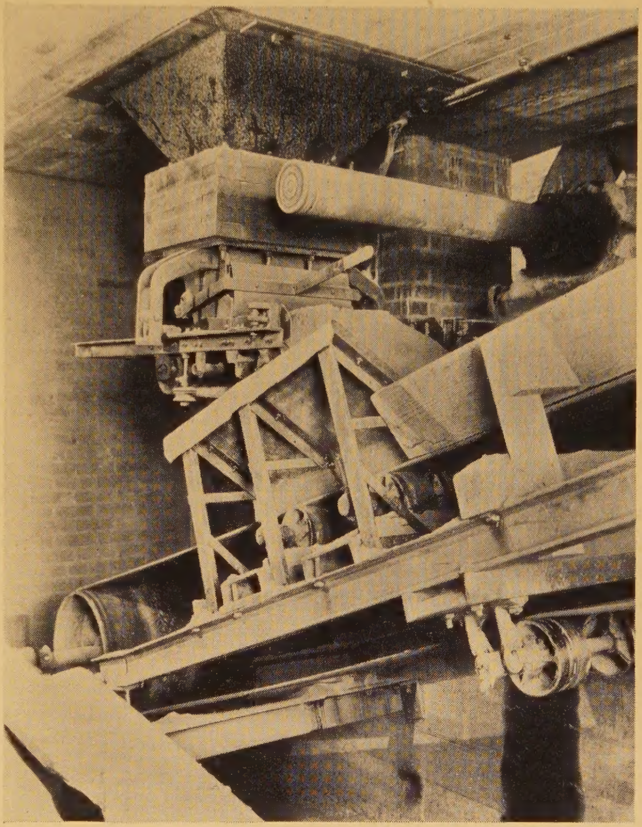
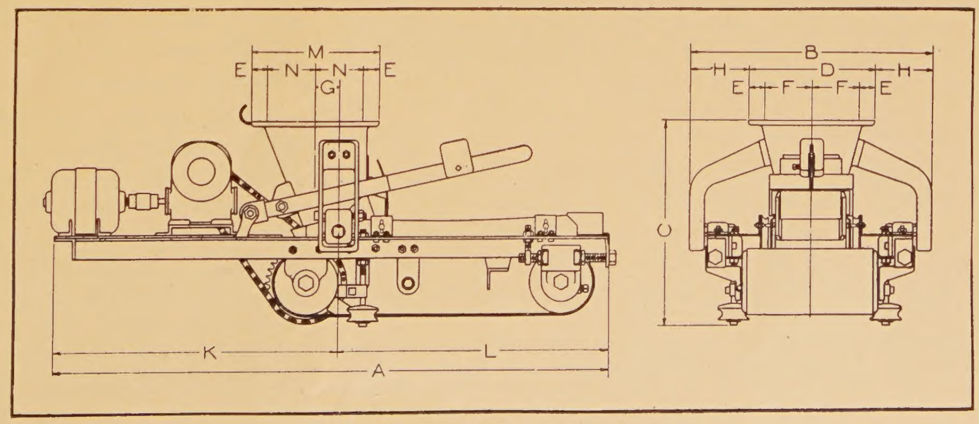


Figure 1. Constant-weight dry feeder in operation

Primarily, these feeders are not only accurate to a high degree, but they are simple and inexpensive in operation, and the installation cost is low. They constitute one of the most recent developments contributed to the cement mill field by the Hardinge Company.

Figure 2. Manufacturer's detail of constant-weight dry feeder



Available Devices for Determining Particle Size Distribution

By **J. C. PEARSON**
Director of Research
Lehigh Portland Cement Co.

THE manufacture of portland cement involves two major pulverizing operations—that on the raw materials prior to burning and that on the cement clinker. The fineness of the raw mix and of the finished cement is important from the standpoint of economy and quality, but only within the past few years has there developed a widespread interest in the sub-sieve fineness of these materials. Formerly the fineness of both raw mix and finished product was judged almost entirely by the No. 100 and No. 200 sieve tests, and even the present standard specifications for cement have no fineness requirement other than a maximum residue of 22 per cent on the No. 200 sieve. This requirement, now practically without significance, was a bone of high contention a decade and more ago, and was for a number of years the chief topic of debate in A. S. T. M. Committee C-1 on Cement.

With progress in our general knowledge of the manufacture and properties of cement, it is now quite well established that the No. 200 sieve test is an adequate test of the fineness of the raw mix, but wholly inadequate as an index of cement fineness. For the raw mix, a more complete knowledge of particle size distribution may be desirable and necessary in a study of grinding equipment, but not so for mill control. In the case of cement, however, the particle size distribution is much more intimately related to the properties of the material, and it is in this connection that a considerable amount of work is being done with elutriation and sedimentation methods.

Turbidimetric Method

The latest development in this field indicates that we may eventually talk about cement fineness in terms of "specific surface"—meaning the surface area of the particles in 1 gram of cement. This is quite logical for a material like cement, and would at first glance seem to imply a rather complete knowledge of particle size distribution. However, the turbidimetric method recently developed at the Bureau of Standards promises to eliminate the distribution problem in the control operation.

It is a question at the present time whether the elutriation and other sedimentation methods will not be entirely superseded by this new and relatively fast method; but this is not the case as yet, and we may consider briefly some of the methods now in use.

Elutriators

Elutriation devices are almost entirely confined to air separators or analyzers of one type or another. Those in most general use are one on which a public patent was issued to the writer nearly 18 years ago, and is in effect a modification of Feret's analyzer; another is the Smidth analyzer of the Schone type; and more recently one has been devised by Roller, as reported in the *Proceedings* of the American Society for Testing Materials last year.

All of these employ the principle of subjecting a sample of cement to the action of a vertical air stream of known velocity, utilizing Stokes' law for particle sizes in the general range of 5 to 50 microns. These devices have the advantage of close reproducibility in determinations, but the major disadvantages of slow operation and high cost. Nevertheless, in spite of some overlapping of sizes in its separations, a good air analyzer is perhaps the most dependable device we have to date for a fairly complete mechanical analysis of cement.

Two Sedimentation Devices

Sedimentation devices are fairly numerous. One of the first to be tried was the balance-sedimentation method, substantially as described by Calbeck and Harner in *Ind. & Eng. Chemistry*, Vol. 19, pp. 58-61, 1927.

Of closely similar principle was a device called a micrometer invented in 1929 by Robert T. Knapp (U. S. P. 1,838,628). This apparatus consists of a vertical tube containing a liquid in which the cement is suspended and allowed to settle out. A side tube near the bottom is connected to a Sylphon type of bellows which registers the change in density of the suspension by tilting a mirror, from which a reflected beam of light traces a settling-time curve on a photographic film. The interpretation of this curve is made in essentially the same manner as that obtained in the balance-sedimentation method. The liquid used by Knapp is kerosene containing a few drops of oleic acid, which has proved very satisfactory as a deflocculating and dispersing agent for cement.

A certain group of manufacturers are using for control purposes a special burette in which the cement is suspended in butanol. As the cement settles out it is withdrawn at specified intervals into small containers with as little liquid as possible. In this manner the weights of the separate fractions are obtained directly. The method and its calibration are somewhat empirical, but comparative results appear to be in very close agreement, and the operation is completed in reasonable time.

Finally we have the Bureau of Standards turbidimeter, which employs the modern photronic cell and gives its indications by change in the intensity of a light beam passing through a suspension of cement in kerosene as the particles settle out. It is based on the principle that the shadow cast by the particles in suspension is proportional to the projected area of the particles and therefore to their surface area. Readings are taken at regular intervals of the current generated by the cell, from which the particle size distribution may be calculated.

Paper presented in the Symposium on Industrial Applications of Particle Size Measurement, held at the New York Regional Meeting of the American Society for Testing Materials, March 8, 1933.

Hydration of Tricalcium Aluminate

Tests Determine Character and Approximate Rate of Hydration in Water and in Various Solutions—Effect of Calcium Chloride and Gypsum

A STUDY of the hydration of tricalcium aluminate is important, as it is apparently one of the minerals responsible for the initial set of a portland cement. Rankin and Wright first proved its presence in portland cement by their phase rule studies on the $CaO:Al_2O_3:SiO_2$ system. More recently Brownmiller and Bogue have shown its presence in commercial cements by the use of X-rays. Klein and Phillips, and later Wells, have studied the hydration of tricalcium aluminate and agree that the reaction as a whole is the simple addition of water to the anhydrous tricalcium aluminate as follows:

$$3CaO.Al_2O_3 + nH_2O = 3CaO.Al_2O_3.nH_2O$$

The purpose of this paper is twofold; first, to study the character and the approximate rate of hydration of tricalcium aluminate in water and various salt solutions, principally calcium chloride and sulphate; second, to determine the rate of hydration of tricalcium aluminate in water alone and with calcium chloride and sulphate admixed. The character of hydration was observed microscopically and the products of hydration identified by their optical properties. Photomicrographs were taken frequently for illustration. For an accurate determination of the rate of hydration the Hubble method was chosen.

The Character of Hydration of Tricalcium Aluminate

When tricalcium aluminate is added to water, it passes into solution with dissociation, giving among other things, calcium ions. The calcium and alumina in solution then recombine as the tricalcium aluminate hydrate, and this precipitates.

Calcium ions already present in solution from a soluble calcium salt should retard the formation of calcium ions from the tricalcium aluminate and thus retard its hydration. Dilute solutions of all soluble calcium salts available, which included the calcium chloride, sulphate, acetate, bromide, chlorate, chromate, hydroxide, iodide, lactate, nitrate, nitrite and permanganate, were tested. They all retarded the hydration of the tricalcium aluminate.

The hydrate of tricalcium aluminate is amorphous at first and later crystallizes. In water this crystallization of the amorphous gel-like hydrate takes place almost immediately. There is a border of needle-like crystals around the grains and much amorphous and crystalline hydrated material a short distance out from the grains.

Dilute solutions of calcium salts, besides retarding hydration, strongly inhibit crystallization of the amorphous hydrated material. The hydrate is forming slowly as globules of amorphous material on the surface of the grains. Similar conditions were observed when a saturated calcium hydroxide solution and a very dilute calcium chloride of approximately the same normality as the gypsum and calcium hydroxide solutions were used.

Two, 4 and 8 per cent $CaCl_2$ solutions acted similarly in inhibiting crystallization. The amount of hydrated material at 10 minutes, or the rate of hydration, increased with the concentration of the calcium chloride, until the rate of hydration in the 8 per cent solution was approximately the same as in water alone. A nearly saturated calcium chloride solution, about 37.5 per cent $CaCl_2$, acted more rapidly yet. The tricalcium aluminate was rapidly breaking down to an amorphous mass. At the end of one hour it was practically completely broken down to an amorphous homogeneous mass and hydration was complete.

Tricalcium aluminate was also hydrated in 2, 4, and 8 per cent $CaCl_2$ solutions saturated with gypsum and in similar calcium chloride solutions carrying gypsum suspended in them. No appreciable difference was noted between the effect of these and the ones without gypsum. Crystals of calcium sulpho-aluminate had not appeared at 10 minutes.

When something is present to delay crystallization of the amorphous tricalcium aluminate hydrate, it frequently happens that the grains of tricalcium aluminate can be seen glued together by a gel forming between them. This gluing together will give a stronger bond than that resulting from the interlacing of crystals, and is more to be desired in the setting of portland cement than the interlacing crystal type of bond.

The previous discussion has been on the early hydration of tricalcium aluminate, illustrated by conditions at 10 minutes. What follows is on the later hydration, illustrated by conditions at 24 hr., when hydration is practically complete.

After 24 hr. in water, tricalcium aluminate shows an abundance of crystalline hydrated material. Sometimes, instead of plates, a thick border of fine needles was formed.

Crystals of the Hydrate

Tricalcium aluminate in a saturated solution of gypsum shows large ragged crystals of the hydrate; nothing resembling the sulpho-aluminate is present. If an excess of gypsum is present, the calcium sulpho-aluminate can be seen bordering the grains and in detached spherulitic clusters. The unevenly distributed broader and longer crystals are the excess gypsum. The use of excess gypsum has insured the conversion of the hydrated material to the calcium sulpho-aluminate.

With either a saturated calcium hydroxide solution or a calcium chloride solution of approximately equivalent normality, the hydrate appears as fewer and much smaller crystals. These solutions apparently still inhibit crystal growth at 24 hr. Nothing was seen to indicate the forma-

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Abstract of paper by W. D. Foster in December (1932) *Journal* of the American Concrete Institute.

tion of a tetracalcium aluminate hydrate with a solution of calcium hydroxide or an excess of calcium hydroxide present.

Tricalcium aluminate in 2 per cent $CaCl_2$ solution for 24 hr. is bordered with fine crystals. In 4 per cent $CaCl_2$ solution, the hydrated material is amorphous at 24 hr. but soon crystallizes.

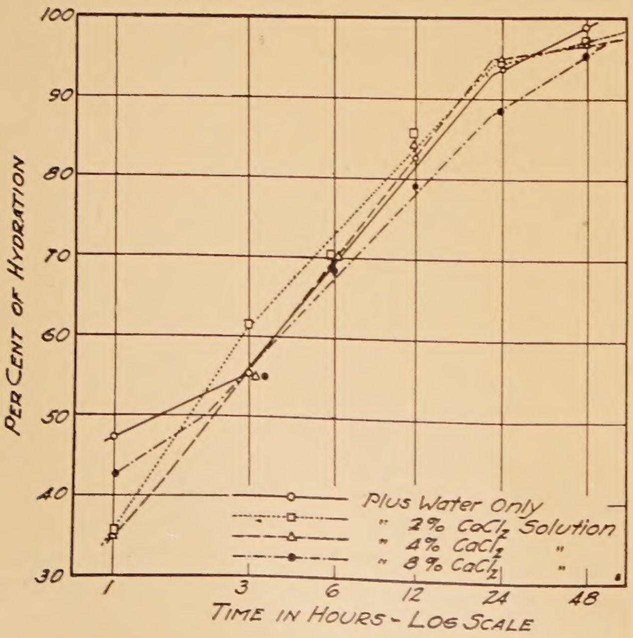
Tricalcium aluminate hydrated in 2, 4 and 8 per cent $CaCl_2$ solution saturated with gypsum is very similar to the calcium chloride solution. In the 8 per cent $CaCl_2$ solution saturated with gypsum, the two salts, apparently working together, have caused a breaking down of the tricalcium aluminate, leaving well defined nuclei embedded in a mass of amorphous material. This had not appreciably crystallized at nine days.

When tricalcium aluminate is hydrated for 24 hr. in 2, 4 and 8 per cent $CaCl_2$ solutions carrying excess gypsum in suspension, it is broken down, apparently by the combined action of the two. With 2 per cent $CaCl_2$ solution and excess gypsum there are prominent nuclei and a small amount of amorphous material. With 8 per cent $CaCl_2$ solution plus excess gypsum the grains are practically completely broken down with almost no evidence of nuclei and with heavy amorphous hydrated material. The 4 per cent $CaCl_2$ solution with excess gypsum is between the extremes. The amorphous material in these did not crystallize appreciably in several weeks of observation.

These experiments show calcium chloride and gypsum to have an additive effect in retarding the crystallization of the material resulting from the hydration of the tricalcium aluminate. The apparent greater effectiveness of calcium chloride than gypsum in inhibiting crystallization of the hydrated tricalcium aluminate may be due only to the greater solubility of the calcium chloride, as at the same concentration the action is nearly identical.

If calcium chloride is used integrally in portland cement, there will be approximately a 4 per cent $CaCl_2$ solution with excess gypsum. Tricalcium aluminate alone in such a solution would be broken down. Whether or not the same thing would happen in portland cement would have to be learned by further study.

The rate of hydration of tricalcium aluminate is shown in the illustration in plain water and in 2, 4 and 8 per cent Cl_2 solutions.



Calcium chloride and gypsum both retard the hydration of tricalcium aluminate. The effect of the calcium chloride seems to be stronger during the early hydration, during a period corresponding roughly to the time taken for the initial set of the cement. After this its effect disappears. The 10 per cent of added gypsum apparently does not retard the hydration of the tricalcium aluminate as much at first, but its effect disappears more slowly, lasting to about 24 hr. This more rapid action of the calcium chloride, both as to greater early retarding and quicker disappearance of the retarding action, may be due entirely to the much greater solubility of the calcium chloride.

The retarding action of both the calcium chloride and the gypsum disappears before the hydration of the tricalcium aluminate is completed. This may mean that the calcium chloride and the gypsum disappear as such, combining with the tricalcium aluminate to form complex compounds. Unfortunately the fact of the disappearance of the retarding effects of the calcium chloride and gypsum was not realized in time to test the hydrating solutions to see if they had actually disappeared. In this series of tests there is enough tricalcium aluminate present to combine with all the calcium chloride in the 2 and 4 per cent solutions, if they form the calcium chloraluminate reported in the literature. It so happens that the 8 per cent $CaCl_2$ solution, in which the tricalcium aluminate might not be able to take up all the calcium chloride, shows a slight amount of retardation when this effect has disappeared in the other calcium chloride solutions. Whether this is more than a coincidence is not known at present. The tricalcium aluminate also would be able to combine with all the gypsum used in the trials in this investigation if it forms either of the calcium sulphoaluminates reported in the literature.

Acknowledgment

This paper is a joint report of the Calcium Chloride Association and the Ohio State University engineering experiment station, resulting from their co-operative investigation of the action of calcium chloride on portland cement.

This work is under the direction of R. C. Sloane, professor of highway engineering, and W. J. McCaughey, chairman of the department of mineralogy, Ohio State University, to whom the writer wishes to express his appreciation for interest shown and assistance rendered. Thanks are due to H. F. Clemmer, representative of the Calcium Chloride Association, for helpful suggestions.

Dissolution Authority Is Sought by Peerless Portland

A petition for the voluntary dissolution of the Peerless Cement Corp., Detroit, Mich., was filed in the circuit court there on May 9 by its officers and directors. June 15 was set for hearing of an order to show cause why the corporation should not be dissolved.

All of the corporation's property has been pledged to secure a bonded indebtedness of about $1,750,000, it was stated.

◆ EDITORIAL ◆

The Code of Fair Competition

FAIR competition is the central idea around which Title I of the National Industrial Recovery Act is written. This is the part of the proposed measure, introduced in Congress on May 17, which deals with industrial associations or groups.

Under the provisions of the proposed law the President may approve any code or codes of fair competition for any associations or groups when it is found that such associations or groups impose no inequitable restrictions on admission to membership and are truly representative of the industry, and that such code or codes are not designed to promote monopolies, or to eliminate or oppress small enterprises and will not operate to discriminate against them.

Every code of fair competition shall accord employees the right to organize and bargain collectively through representatives of their own choosing, and shall provide that no employee shall be required to join any organization or to refrain from joining a labor organization of his own choosing. Employers shall comply with the maximum hours of labor, minimum rates of pay and other working conditions established by the code.

Industries that do not organize under the provisions of the proposed act may, in effect, have limited codes of fair competition imposed upon them.

The President's radio address of May 7 indicated clearly that the main purpose of Title I of the National Industrial Recovery Act is to bring the "unfair ten per cent" into line. His illustration drawn from the textile industry has its counterpart in almost every industry, for hardly one has escaped the successive waves of price-cutting and ruinous competition that have characterized American industry since 1929.

No one will deny that governmental supervision and virtual price-control have their disadvantages, especially in a period of rising prices, when manufacturers' associations may find it difficult to obtain authority for price increases in keeping with increases in the cost of their raw materials. On the other side of the picture are the painful past experiences resulting from unbridled competition and overproduction. A choice must be made between the two, for there is no alternative.

Regardless of inevitable disadvantages, about the most unpopular thing any industry could do would be to resist the operation of the National Industrial Recovery Act. Assuming that the measure will be passed substantially in the form in which it was introduced, industry will be given the opportunity to regulate itself, under governmental supervision. In his acceptance of the plan in behalf of the steel industry, Charles M. Schwab is quoted as having asserted that industry must learn to regulate itself wisely and for the public good, if it is to escape direct governmental regulation.

Surely the cement industry will not be found among the laggards when the details of the partnership between government and industry are being put into operation. Wholehearted co-operation will be the wisest course to pursue.

A Cabinet Member Is Out of Step

A STRANGELY discordant note was heard in Washington on May 5, when Harold Ickes, Secretary of the Interior, was quoted as having denounced the mythical cement trust as a result of bids for cement for Boulder Dam.

The quoted statements were so completely inaccurate that many believed the secretary had been misquoted; but later developments brought no denial of the first newspaper reports.

For illustration, he was reported as saying that the ten bids submitted were identical, and that the mill price of $1.29 was 20 cents a barrel higher than was asked two months before.

To begin with, the time interval since the last previous bids was seven months, instead of two months. During that interval cement prices throughout the country had gone up, along with prices of other commodities; but the secretary's statement is in fact misleading, for the previous bids (received on September 26, 1932) were for ordinary standard portland cement, while those submitted on April 24 were for a special low-heat cement.

As explained further in an interview by John Treanor, president of the Riverside Cement Company, one of the bidders, the bids submitted were not identical, but covered a wide range whether considered on the basis of mill price or delivered price. The mill price submitted by Riverside was $1.55 instead of $1.29.

The statement given out by the Secretary of the Interior contains so many factual mistakes that it must have been based on a complete misunderstanding or misinterpretation of facts submitted to him by his assistants.

One hears much in these days about the desirability of returning to the price levels of 1926. There is ample basis for the belief that the national administration has set that level as its goal. If that is true, individual government officials should know that those levels must be attained by all commodities if the nation's business is to be restored to a condition of health.

House Building and Low-Cost Roads Discussed at Spring Meeting

New York Gathering of Portland Cement Association Members Hears Allan, Fleming and Fairman on Markets

RESUMPTION of house building on a large scale, which must start soon because of the growing home shortage in the country, will be a major activity which will hasten business recovery. This was pointed out by W. D. M. Allan, director of promotion of the Portland Cement Association, in an address before the spring meeting of that organization held at the Waldorf-Astoria Hotel on May 15, 16 and 17.

Shortage of Houses a Fact

A shortage of 536,000 homes existed in the entire United States at the start of this year, Mr. Allan declared. Add to this the normal requirement of 534,000 new homes annually to take care of population increase and necessary replacement of old houses, and we have a total of nearly one million homes which should be built this year. These figures are taken from data gathered by the federal bureau of labor, and other organizations.

In large cities the trend now is toward the smaller type of dwelling, Mr. Allan said. Decentralization of industry and continued population migration from the crowded areas to small towns and the country will strengthen this trend. Therefore, it is estimated that for several years to come new construction will be almost entirely one-family dwellings.

The cement industry has had a leading place in the movement to build better homes at moderate costs. New concrete products and refinements in concrete construction which bring great advantage to the builder have been introduced. These reduce upkeep costs and losses from fire and other hazards of nature. The public is beginning to realize the excessive waste of impermanent types of housing.

What Is a Low-Cost Road?

When road users become more fully aware of what happens to their gasoline tax and license fee payments, there will be a decided improvement in road building. This declaration was made by E. M. Fleming, manager of the highways bureau of the association.

Many times so-called low-cost roads are actually high-cost roads, Mr. Fleming said, because of the yearly expenditure of large sums for upkeep and replacement. Furthermore, these roads may run up the routine costs of operating vehicles to a considerable figure, with less miles per gallon and high car repair charges.

Consequently, low-cost highway transportation is dependent upon the building of roads and the lowest total cost to the motorist. The less demanded for road repair and rebuilding, the more there is available to build additional mileages of high type roads.

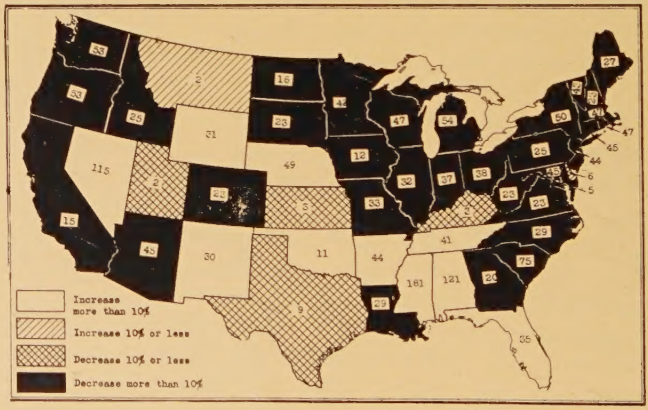
How high type motoring facilities are being brought to secondary roads at a low cost was told in an address by J. R. Fairman, manager, eastern offices.

Mr. Fairman explained that the interest of engineers in cement-bound macadam pavements has been revived because of the necessity of building local roads not only at a low original cost but with a low maintenance cost. Cement-bound macadam, once a patented pavement, was used years ago. Mileages 25 years old are still in service.

Last year several experimental stretches of this pavement were built in the East and Central West, which were of such marked success that many communities are planning comprehensive programs. Contracts for 17 miles of cement-bound macadam pavement have been let in six states and construction of 75 miles is planned in eight more. Mr. Fairman considers this remarkable for a pavement so recently proposed for use on light traffic roads.

Cement-bound macadam in appearance is similar to concrete pavement, but the road is built without a paving mixer. A compacted layer of stone is first placed on the roadbed and then a cement mortar is rolled into it as the binding unit. It can be built by the average contractor with simple equipment and non-specialized labor, said Mr. Fairman.

The April Cement Map



Shipments of portland cement in April, 1933, are compared with shipments in April, 1932, in this map, issued by the U. S. Bureau of Mines.

Porto Rico Trade Survey Being Made by Traynor

A thorough survey of the cement situation, as it affects trade between the United States and Porto Rico, in contrast with shipments from Denmark, Belgium and other European countries to Porto Rico, is being made by F. M. Traynor, of Tampa, president of the Florida Portland Cement Co.

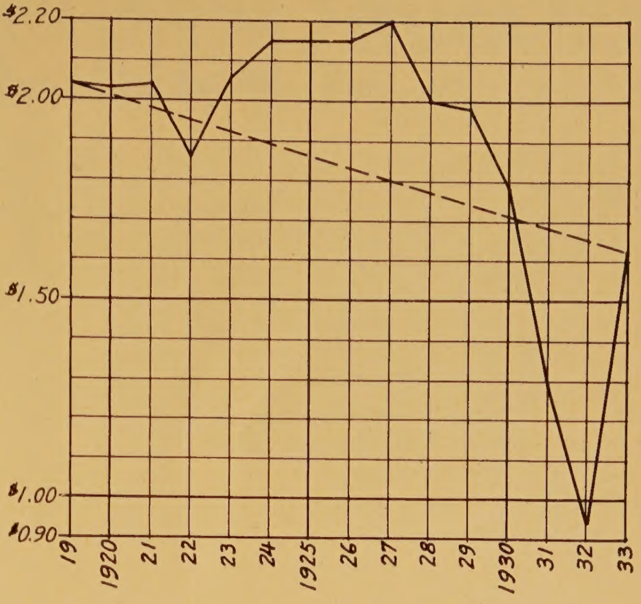
Useful Information for the Governor of Illinois

The highway cement situation in Illinois has practically attained the status of a "closed incident" with the adoption of a legislative measure authorizing the governor of the state to buy cement in the open market.

Presumably the governor hopes to get a better price than the bid of $1.62 per barrel, including freight to the county seat, which cement manufacturers offered him.

On the other hand, the governor may consider himself exceedingly fortunate if he can get under that price, for the accompanying chart shows that the state of Illinois has paid considerably more than $1.62 per barrel in every year since 1919, aside from 1931 and 1932, when a cement price war was in full swing.

It is to be hoped that the governor's highway department assistants will bring this chart to his attention. It is a simple chart, but it contains useful information.



Price per barrel paid for cement by State of Illinois since 1919. The figure of $1.62 indicated for 1933 represents the bid price rejected by the governor

Roosevelt Should Talk to Ickes

(Editorial from *The Jersey Journal*, Jersey City, N. J., May 6, 1933)

The gold and curency problems are not the only confusing things about the new deal.

Thursday night the President told the United States Chamber of Commerce that business must quit cut-throat competition and co-operate. He said:

> "In almost every industry an overwhelming majority of the units of the industry are wholly willing to work together to prevent overproduction, to prevent unfair wages, to eliminate improper working conditions. In the past success in attaining these objectives has been prevented by a small minority of units in many industries. I can assure you that you will have the co-operation of your government in bringing these minorities to understand that their unfair practices are contrary to sound public policy."

Friday Secretary of the Interior Ickes filed a complaint with the Federal Trade Commission that the "cement trust" had submitted ten identical bids for cement for Boulder dam in the Colorado River, and that these bids were identical because the "trust" had entered into an agreement to raise prices to the government. Mr. Ickes threatens to put the government in the cement business by building a plant to manufacture cement for government projects unless some cement concern is willing to accept a contract to make cement at "fair prices." He said:

> "It should be borne in mind that an increase in the price of materials will take just that much away from funds available for labor. The more we give to the cement trust, the less we have left for wages."

But if the ten cement companies which submitted identical bids did conspire, it is possible that the reason they conspired was to "prevent unfair wages and to eliminate improper working conditions"; certainly the cement industry would be interested in preventing overproduction.

If the government is going to threaten every industry from which it might buy materials for public works with government competition as soon as an increase in prices appears around the corner, what becomes of inflation? The President also said, on Thursday:

> "We (the government) have sought through moderate and wise measures to increase the volume of trade, to give employment to the unemployed, and to effect a broad elevation of commodity prices."

Cement is a commodity. If the big concerns, which would be able to supply the big orders the government is preparing to place, don't set the pace, the little fellows can't: a rise in the price of cement is a blessing for which the industry should thank Mr. Roosevelt, and a sin for which Mr. Roosevelt's secretary of the interior proposes to prosecute the industry.

Equally confusing—the railroad bill compels railroads to co-operate and consolidate—the earmarks of a trust in the making; and all the powers which the President urges Congress to give his federal co-ordinator of railroads are powers the exercise of which will tend to stiffen freight and passenger rates. But to Mr. Ickes a trust is wicked.

Mr. Ickes is old-fashioned. He is trying to protect the public purse by buying from the lowest bidder. The President wants lowest bidders to bid higher.

Cement Industry Is Made Victim of Political Arithmetic

NO better illustration of how politics thinks only half way through a situation is found than in the current hullabaloo about cement prices for Boulder Dam, says Phil S. Hanna in a copyrighted article in the *Chicago Journal of Commerce*, May 8, 1933. Secretary Ickes is upset because cement prices are higher and because they are nearly all uniform. He even goes so far as to say "that a similar situation arose in Illinois when the governor was unable to get fair (?) bidding for cement to be used in public construction of roads."

At the same time this wail comes from one side of the cabinet table, another government official is about to embark on a program to raise prices. In addition, the administration itself is bending every effort to increase prices. Overlooking the fact, however, that the cement companies are losing money even at present prices—why is the cement manufacturer singled out and called a conspirator for asking higher prices?

The half of the picture that politics does not see is that (1) cement prices are almost uniform because the product is uniform, and, (2) like wheat or sugar, portland cement has become a standardized commodity; (3) the costs of production vary but little and the most efficient producer sets a bench mark which less efficient producers have to shoot at. This gives the entire cement market the benefit of the lowest costs in the industry.

No attention is paid by Secretary Ickes to the fact that all of the leading cement companies lost heavily in 1932 and are reporting losses for the first quarter of 1933. Would it be in line with the President's program of recovery for the cement companies to quote the low prices of last year, and, in order to manufacture at those prices, go out and cut their labor rates, or should they try to get a better price than last year to insure staying in business and paying at least as good labor rates as last year or better?

Cement Trust a Myth

Michigan learned long since that talk about a cement trust is just another myth. They took a heavy loss on a state cement plant experiment and called it a day. It is, of course, possible that the Pacific Coast cement makers have a somewhat different cost set-up from those in the Middle West, but the price which they quoted of $1.29 a barrel is not out of line with Middle Western prices. It does not follow by any logic, however, that there is any conspiracy or any price-fixing agreement by the cement companies.

Cites Supreme Court Decision

A previous administration, along in 1925, suffered the same hallucinations that Secretary Ickes and Governor

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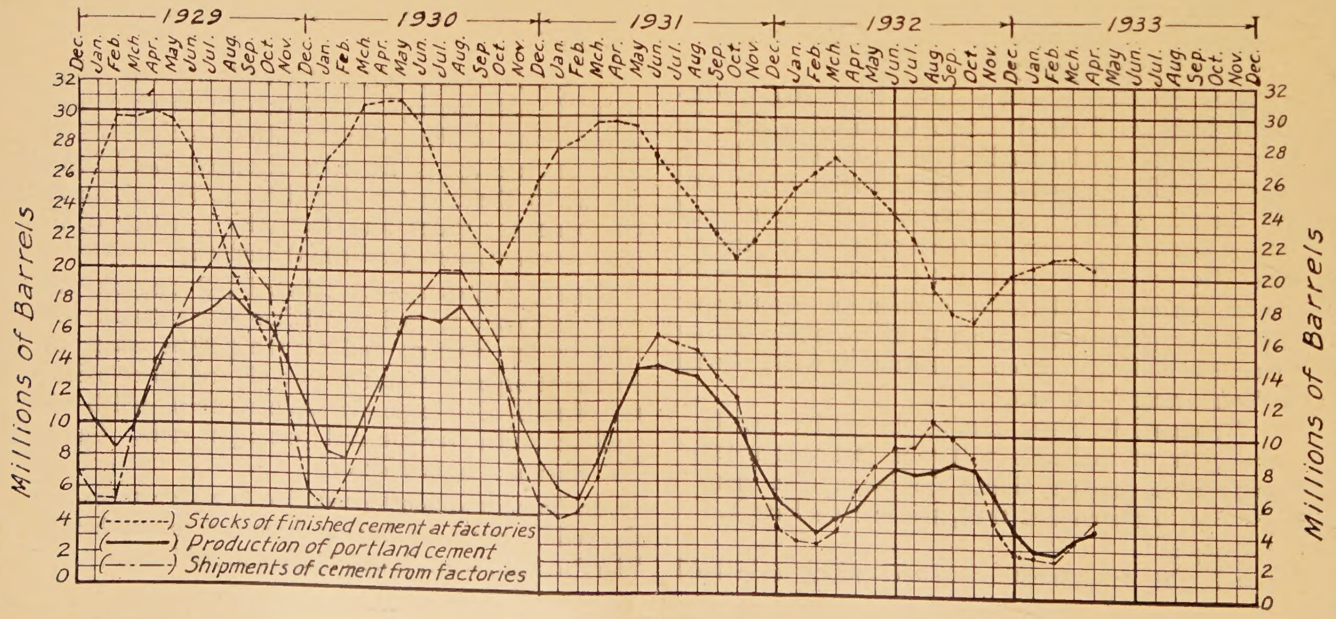
Cement Statistics for April

Relation of Production to Capacity (Per Cent)

	The Month	Twelve Months
April, 1933	18.9	26.2
April, 1932	24.8	41.7
March, 1933	16.1	26.7
February, 1933	13.4	27.1
January, 1933	12.9	27.6

Production, Shipments and Stocks of Finished Portland Cement (Barrels)

	1932	1933
Production, April	5,478,000	4,183,000
Shipments, April	6,536,000	4,949,000
Stocks at end of month	26,496,000	20,532,000
Production for year to date	19,322,000	13,597,000
Shipments for year to date	17,020,000	13,336,000



Horner are suffering. The matter even went so far as the supreme court, which found that uniformity of prices was no indication of conspiracy or unjustifiable trade practice. Even at that time the government, in its suit, admitted that similar products of identical qualities tend to seek a uniform price level in any given market at the same time. The victims of the conspiracy, if any there be, seem more likely to be the cement companies and their employes who are marked for slaughter simply because politics can not get it through its head that the costs of making cement are nearly uniform and the product almost 100 per cent standardized.

Will U. S. Government Set Example?

But there is a deeper significance still. The president asked business to raise wages almost simultaneously with Secretary Ickes' complaint about higher cement prices. If the government as consumer is going to set an example of refusing to pay higher prices after it has helped to whoop commodity prices up (and threatens to go into competition with cement producers) where under the sun —if all consumers follow suit—is business going to get the money to pay higher wages?

This is a sample of the one-way-street arithmetic that comes when politics goes into fields that ought to be left to private initiative. Multiply it by the thousands of similar instances occurring every day, where government is in private business, and you get a good panorama picture of why taxes are going up and taxable income is going down.

Near-Capacity Operations Numerous as Plants Reopen

May 1 or thereabouts was reopening day for many plants. For at least one it was the first operation in a year. The majority expect to remain open at least until October.

The Portland Point (New York) plant of Penn-Dixie terminated a year's shutdown when it resumed on a 75 per cent basis May 1, calling back 135 men.

Full operations are under way at the Petoskey plant at Petoskey, Mich. The plant will continue to employ the force of 200 until October, according to Manager John L. A. Galster.

The Hawkeye and Penn-Dixie plants in Iowa likewise resumed early in May. The Hawkeye put 200 men to work at the plant, and 40 in the quarry, according to H. Krarup, superintendent. The Pennsylvania-Dixie is employing 75 men at the plant and 20 in the quarry.

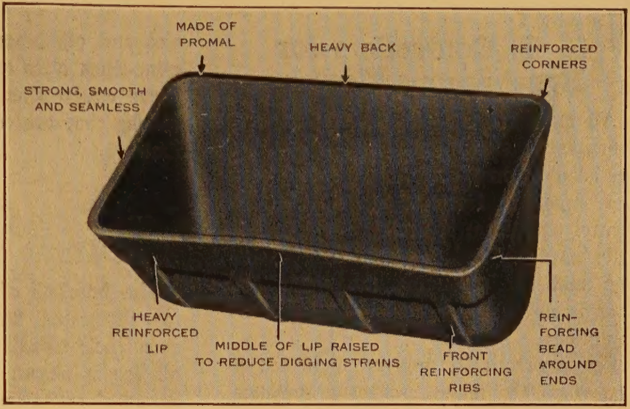
Among other mills to reopen are the Cumberland at Cowan, Tenn.; Alpha at West Virginia; Lone Star at Limedale, Ind., the Colorado at Florence, Colo., and the Lawrence at Rockland, Me.

Boulder Dam Cement Awards to Four California Firms

Four Los Angeles cement companies submitted a joint low bid on 400,000 bbl. of heat-resisting cement to be used in construction of Boulder Dam. The combination, which included the California Portland Cement Co., the Riverside, the Monolith, and Southwestern companies, bid $1.55 a bbl., a total of $620,000.

PROMAL BUCKETS

Made of the Stronger, Longer-Wearing Metal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For Severe and Heavy-Duty Elevator Service

THIS new bucket, designated as Style "AAP", embodies exclusive features and improvements which make it ideal for handling every abrasive material. It is more substantial, and the metal is so distributed that the maximum in wear resistance and endurance is obtained. Correctly reinforced at vital points, this bucket stands up under the most severe conditions of service.

It is made of PROMAL, the stronger, longer-wearing metal. Great Strength, toughness and resistance to abrasive wear are its characteristics.

Bucket users on the alert to reduce operating expense will find it real economy to install Link-Belt "AAP" PROMAL buckets. They can be furnished in all standard sizes.

Other Link-Belt Products Include:

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Conveyors and Elevators for all materials—
  Chain, Flight, Apron, Pan, Belt, Screw, Bucket Ribbon, Paddle, Trolley, etc.
Car Spotters
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See our exhibit at A Century of Progress, Chicago

MILL EQUIPMENT

G. E. Controllers for Synchronous Motors

All standard lines of General Electric synchronous motor control have been superseded by new lines incorporating new and important features. Included in this control equipment are relays for automatically applying and removing field excitation and for protecting the stator and amortisseur windings under all operating conditions.

For automatically applying field excitation when the motor reaches a predetermined speed near synchronism, a new relay known as the slip-frequency field-application relay is provided. The coil of this relay is connected across a section of the field discharge resistor with a half-wave copper oxide rectifier in series with it.

●

Junior Firebrick

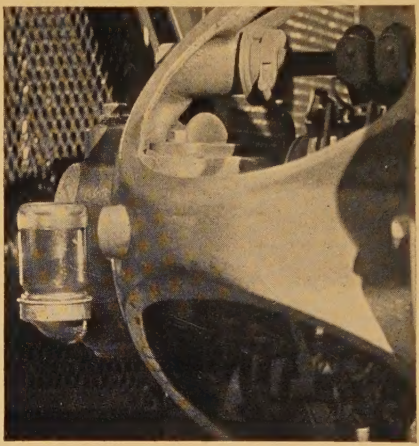
The Babcock & Wilcox Co. announces the addition of a new firebrick, B & W 80 Junior, to its line of refractory products. The 80 Junior has been developed to meet the conditions existing between the moderate service economically met by fireclay refractories and more severe conditions.

It is for this field, in which fireclay brick are unsuitable, or are only moderately satisfactory, from the standpoint of service life, and in which the B & W 80 firebrick is uneconomical because of its high price, that the B & W 80 Junior was developed. The B & W 80 Junior is in no sense a substitute for the B & W 80 firebrick—it being for service in fields not covered by the 80 firebrick—fields in which the premium-priced, super-refractories and other special bricks of the alumina-silica class are now used, but which prove costly when installed to meet conditions that are near their upper service limits.

●

Less Than One Ounce of Oil in Three Years' Service

The brackets of the Westinghouse motor illustrated have not been disturbed since their installation in June, 1929. The oil feeder shown is composed of an inverted glass jar holding about four ounces of oil when full. No oil has been added to the bearing or fountain since the day of installation. The motor is a 30 hp., 1750 rpm. direct current motor. This motor has been running eight hours a day every working day since its installation.



At the present time it is running as good as ever with apparently no reason why it should not continue to operate without the addition of oil for a long time to come.

✦ Industrial Literature ✦

Amsco Welding Rods

Amsco nickel manganese steel and No. 459 hard-surfacing welding rods are described in a 4-page folder issued by the *American Manganese Steel Co.*, Chicago Heights, Ill.

Typical applications given are the renewal of bucket lips, crusher jaws, car couplers, and clinker drag chain.

●

Crusher Booklets

The Symons cone crusher is described in two catalogs prepared by the *Nordberg Mfg. Co.*, Milwaukee, Wis.

One is an 8-page publication confined to the short head type, while the larger catalog covers the construction, capacity, action and lubrication of all types and sizes.

●

Bearing Lubrication

Housing Design for Ball Bearing Lubrication is the title of one of the articles contained in the current issue of the *Dragon*, a *Fafnir Bearing Co.* (New Britain, Conn.) publication.

Sketches show "right and wrong" arrangements.

Heating Units

Electric Heating Units and Devices is a new catalog of the *General Electric Co.*, Schenectady, N. Y.

Types of equipment covered are small heating units and devices designed to eliminate extensive piping and equipment.

Field Activities

Link-Belt's Unique Exhibit at "A Century of Progress"

Among the industrial exhibits to be seen at A Century of Progress Exposition, opening at Burnham Park, Chicago, on May 27, is that of *Link-Belt Co.*, engineers and manufacturers of conveying and power transmitting machinery.

Equipment to be exhibited includes a "mystery" drive and an operating model of the firm's rotary railroad car dumper.

The company is portraying by 50 dioramas and translite illustrations, many of the modern methods employed in handling materials mechanically from "where they are to where you want them," throughout the industries of the world. The dioramas are mounted on display cases built to accommodate full-size products, giving the visitor the opportunity to see the conveyors, in miniature, in diorama form, and at the same time obtain a good idea of the construction and size of many of the machinery parts.

●

Consolidate Meter Interests

Worthington Pump and Machinery Corp. and *Gamon Meter Co.* have consolidated their operations in the manufacture and sale of meters, through the newly organized *Worthington-Gamon Meter Co.* Sales headquarters for the company have been established at Harrison, New Jersey. All manufacturing operations, however, will be concentrated in the Gamon plant nearby, in Newark, New Jersey.

●

Amsco Alloys Succeed Fahralloy

Under a new agreement with *F. A. Fahrenwald*, the *American Manganese Steel Co.*, Chicago Heights, Ill., retains the rights to use certain patents issued or pending and grants the inventor of the metal the exclusive use of the registered trade name *Fahralloy*.

The nickel-chromium alloys hereafter made and sold by the company will be known by the trade name *Amsco Alloys*.